

# Digital Safety Systems Diversity and Defense in Depth

Addressing the Issue Through Cooperative Research

## Background

Adding diverse systems and defense-in-depth features can prevent or mitigate the effects of common cause failures.

The potential for common cause failures leading to failures of protective actions and industry experience has prompted the development of NRC staff guidance, a Branch Technical Position (BTP), and revisions to the Office of Nuclear Reactor Regulation Standard Review Plan (NRR SRP).

The NRC and industry are addressing the issue of determining how much diversity and defense-in-depth are required to protect public health and safety and the environment.

### Research Objectives

The research objective is to update licensing guidance with recommendations and diversity strategies for digital safety system designs.

- Determine precedents for good engineering practice For example, diversity and defense-in-depth strategies used by other countries, industries, and agencies.
- Endorse standards that can provide regulatory guidance For example, ANS/ANSI 58.8-1994, "Time Response Design Criteria for Nuclear Safety-Related Operator Actions."
- Identify sets of diversity attributes that provide adequate diversity For example, combinations of NUREG/CR-6303 diversity attributes and associated criteria.
- Support NRR in developing regulatory guidance

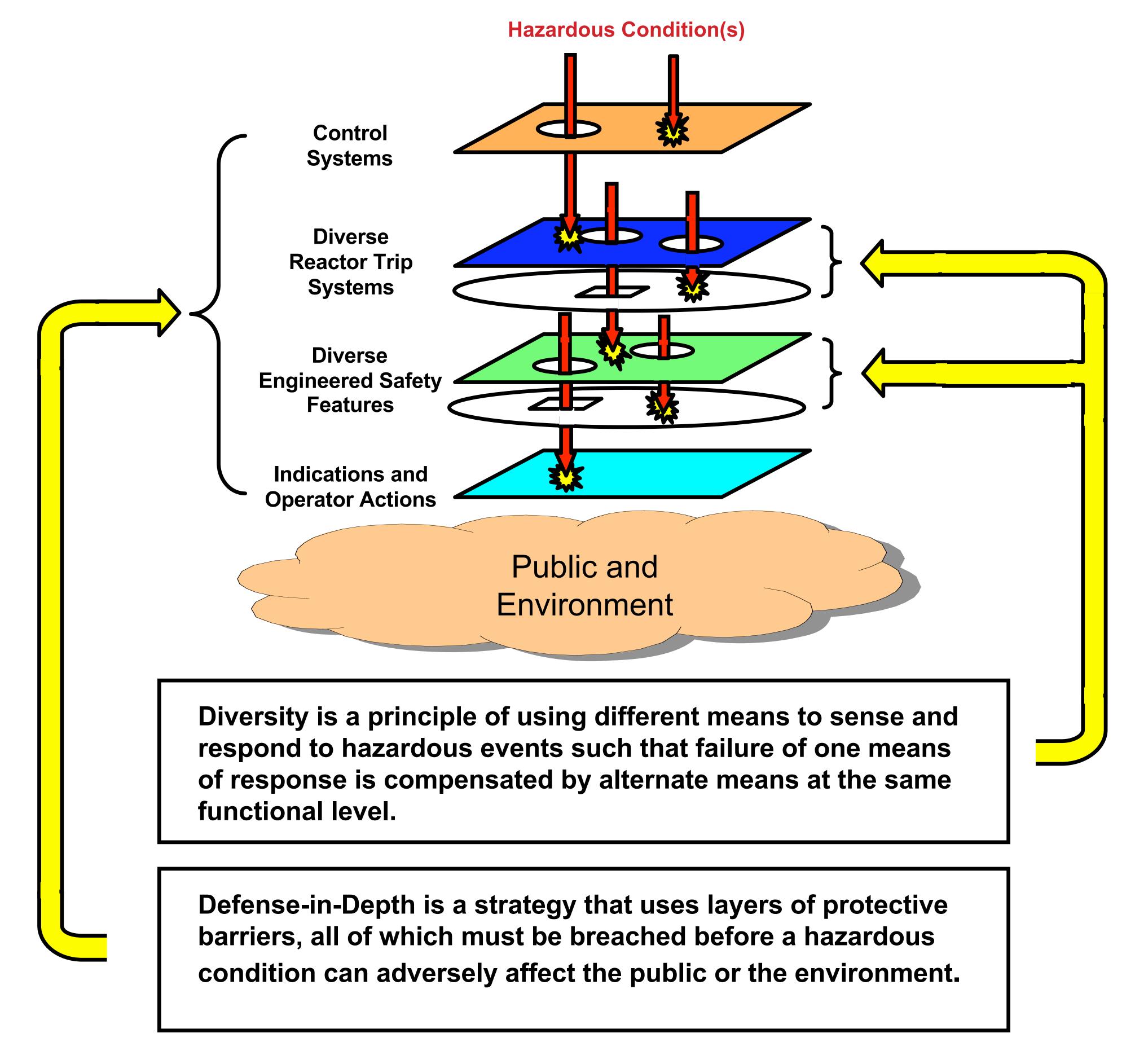
#### Regulatory Outcome

- Clear regulatory guidance for licensing digital I&C systems
- Consistent licensing process
- Reduction of licensing uncertainty

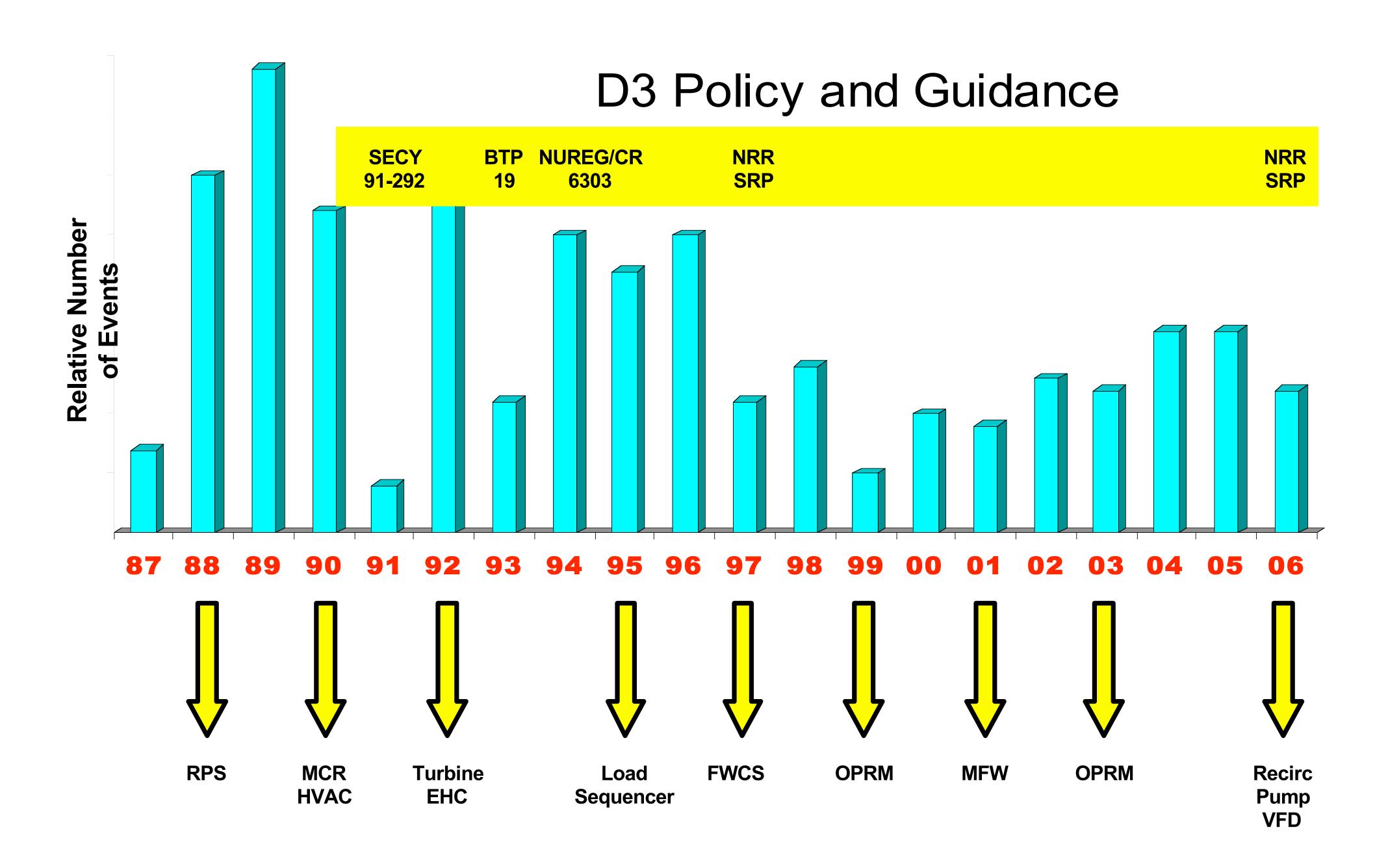
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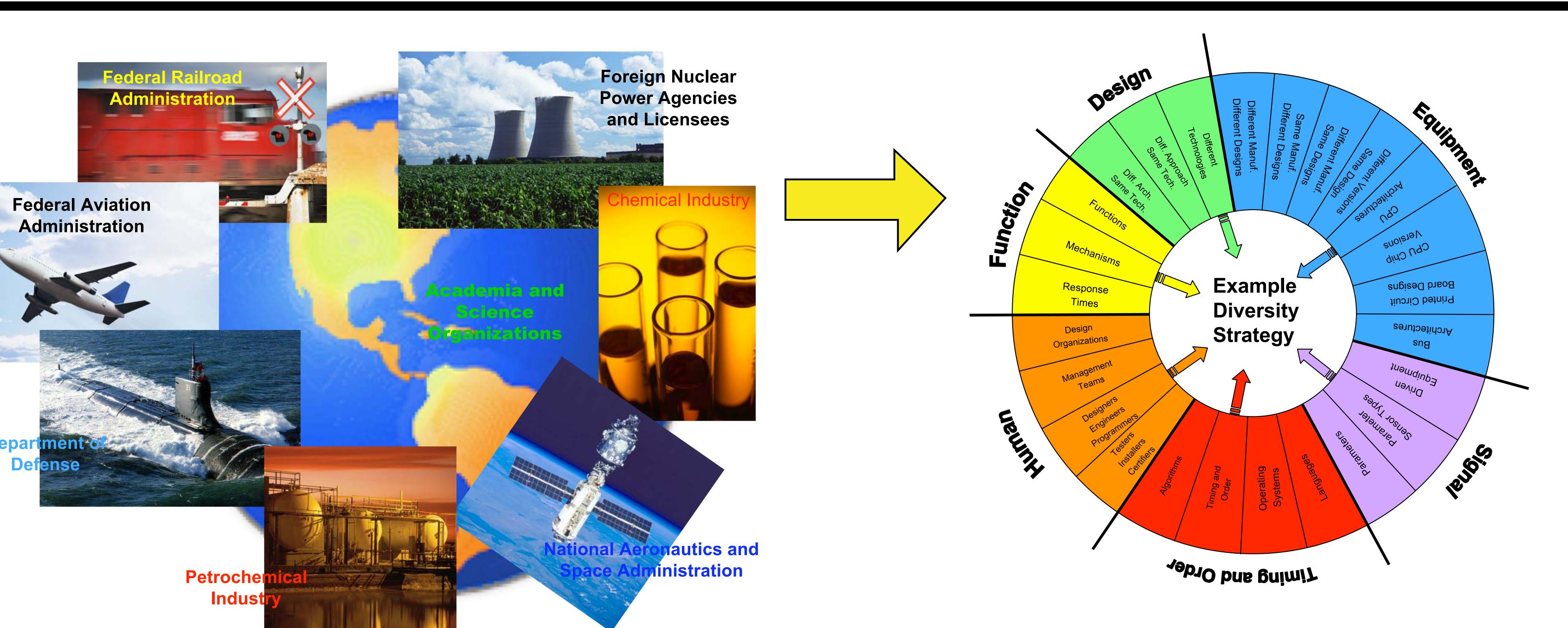
# DIVERSITY AND DEFENSE-IN-DEPTH IN DIGITAL SAFETY SYSTEMS



#### **Historical Perspective**

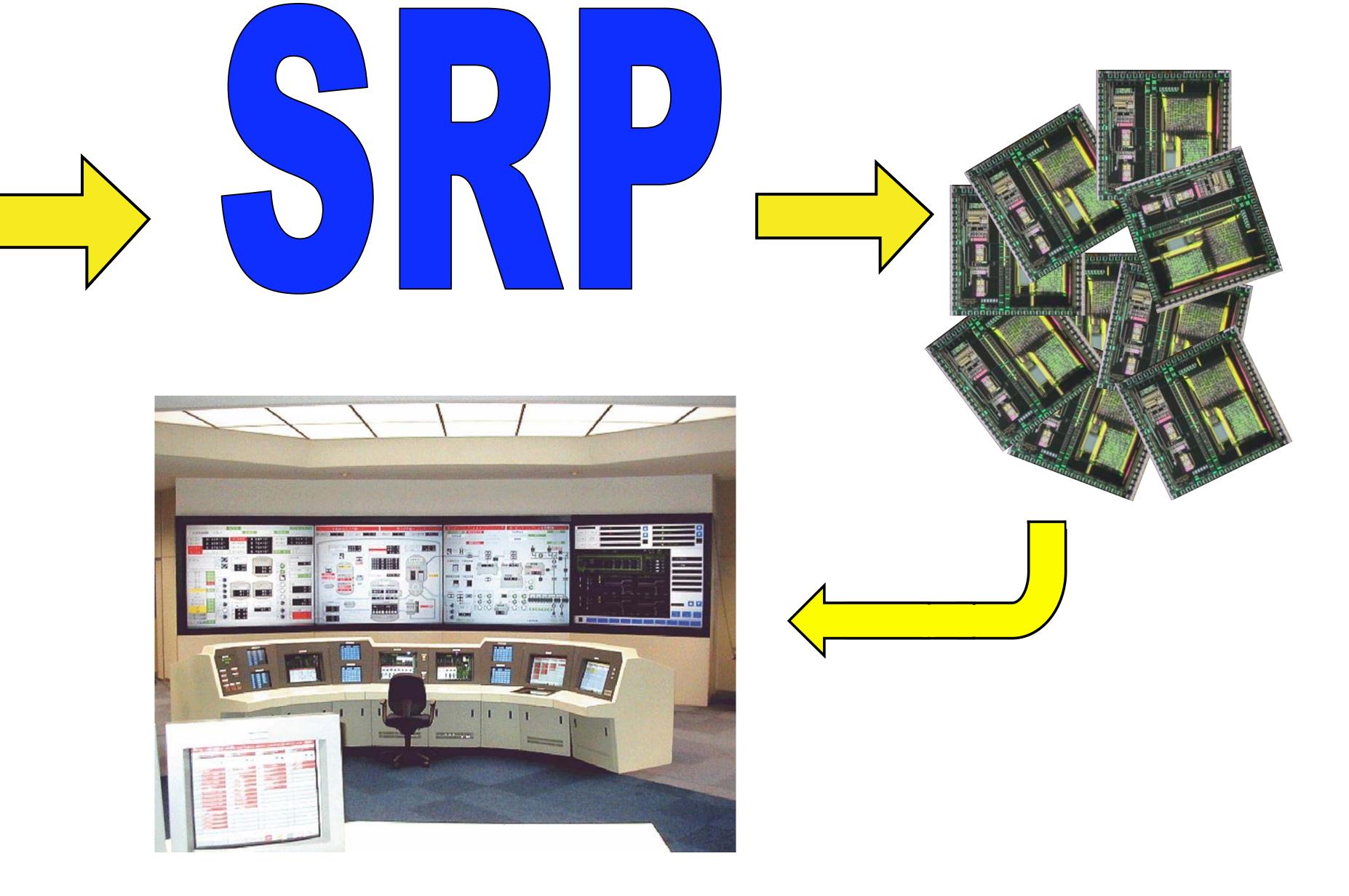


While the U.S. nuclear industry has an excellent safety record, digital system failures and upsets have been reported.



Correlate Guidance and Recommendations

with Diversity Attributes and Technical
Criteria to Develop Diversity Strategies



Update Licensing Guidance With Recommendations and Diversity Strategies for Digital Safety System Designs